ED 053 173 **THE COMPARISON OF GPA REGRESSION EQUATIONS FOR REGULARLY ADMITTED AND DISADVANTAGED FRESHMEN AT THE UNIVERSITY OF ILLINOIS.**

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ABSTRACT

The regression equations of first semester grade point average (GPA) on high school percentile rank (HSPR) and verbal and quantitative score on the Cooperative School and College Ability Tests (SCAT) were significantly different for men and women regularly admitted freshmen and men and women freshmen admitted to the Special Educational Opportunities Program (SEOP) at the University of Illinois. HSPR and SCAT Verbal scores were useful predictors of GPA for all groups. However, separate regression equations for the prediction of GPA were indicated, since there were significant differences in the regression coefficients of the independent variables among the four groups. (Author)

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The Comparison of GPA Regression Equations for Regularly Admitted and Disadvantaged Freshmen at the University of Illinois

by

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Abstract

The regression equations of first semester grade point average (GPA) on high school percentile rank (HSPR) and verbal and quantitative score on the Cooperative School and College Ability Tests (SCAT) were significantly different for men and women regularly admitted freshmen and men and women freshmen admitted to the Special Educational Opportunities Program (SEOP) at the University of Illinois. HSPR and SCAT Verbal scores were useful predictors of GPA for all groups. However, separate regression equations for the prediction of GPA were indicated, since there were significant differences in the regression coefficients of the independent variables among the four groups.

THE COMPARISON OF GPA REGRESSION EQUATIONS FOR REGULARLY ADMITTED AND DISADVANTAGED FRESHMEN AT THE UNIVERSITY OF ILLINOIS

Similar predictive validities for commonly used ability tests have been reported for black and white college freshmen in recent studies (Munday, 1965; Biaggio, 1966; Cleary, 1968; Davis, Loeb & Robinson, 1969). Comparative studies within integrated colleges have probably been based upon black and white freshmen groups who, though showing large mean ability test differences, meet common local admission standards. The admissions scene is changing, since many universities are now recruiting minority group freshmen into special college programs. Thus, the population of disadvantaged freshmen applicants is expanding, mean test score differences between regularly admitted and disadvantaged groups are apt to grow larger, and the introduction of compensatory or remedial coursework will possibly change customary criteria of early academic success. Examination of the validities of preadmission test scores, alone and in combination with high school achievement measures, for predicting the success of students in these special programs is needed in order to develop, if necessary, more effective selection policy.

SUBJECTS AND VARIABLES

In September 1968, the University of Illinois at Urbana admitted 515 beginning freshmen, most of whom were black, to its Special Educational Opportunities Program (SEOP) designed to admit students who other-

wise would probably not have access to college. Increased financial aid and tutorial services were budgeted, and several departments, principally rhetoric, mathematics, and psychology, developed special first year courses for SEOP freshmen.

In general, freshmen admitted to the SEOP met minimum but not competitive admissions requirements. Enrollment pressure in recent years has caused the university to select freshmen, within each college to which they apply, on the basis of predicted first semester grade point averages calculated from high school percentile rank (HSPR) and Composite score on the American College Test (ACT). This test battery is taken by a majority of applicants during the last half of their junior year in high school. SEOP applicants, many of whom presumably had no firm plans to attend college, were recruited during the latter part of their senior year in high school or during the summer preceding admission. Consequently, ACT scores were unavailable for approximately half of the SEOP freshmen. However, scores on the Cooperative School and College Ability Tests Form 1A (SCAT) and the Cooperative Reading Comprehension Test Form UA (COOP Reading), administered by the Student Counseling Service as part of the routine freshmen guidance examination program during the spring and summer of 1968, were obtained for approximately four-fifths of the SEOP freshmen.

First semester grade point averages (GPA), computed on a 5 - point scale, were obtained for both regularly admitted and SEOP freshmen; averages for SEOP were based upon grades earned in regular courses as well as grades earned in the above-mentioned special courses, which typically comprised about half of the course load carried by SEOP freshmen.

GRADE POINT AVERAGE VALIDITIES

Since more SCAT than ACT scores were available for SEOP freshmen, the comparative predictability of grade point average for regularly admitted and SEOP freshmen was examined by regressing GPA on HSPR, SCAT Verbal, and SCAT Quantitative scores. Data were obtained for 168 men and 237 women admitted to the SEOP and for 2938 men and 1917 women who were regularly admitted beginning freshmen in September 1968. Means and standard deviations for these measures are shown for the four freshmen groups in Table 1 as well as means and standard deviations for GPA earned in regular courses, GPA earned in special courses and the number of credits taken in special courses by freshmen in the two SEOP groups. Intercorrelations among all measures are presented in Table 2.

Tables 1 and 2 about here

Means on all variables were considerably lower for the SEOP than for the regularly admitted freshmen. The greater HSPR variability for SEOP freshmen probably reflects less selective criteria for their admission, while their smaller SCAT score variability may be due to the relative difficulty of these tests for SEOP freshmen.

For both sexes, HSPR correlations with the two SCAT scores were significantly higher for regularly admitted freshmen than for SEOP freshmen. GPA correlations with HSPR and the two SCAT scores were not significantly different for SEOP and regularly admitted women; GPA correlations with HSPR and SCAT Quantitative were significantly higher

for regularly admitted men than they were for SEOP men. Inconsistent comparability of high school grades for black and white freshmen has been reported (McKelpin, 1965; Munday, 1965; Harris & Reitzel, 1967; Cleary, 1968, Thomas & Stanley, 1969).

The mean GPA earned by SEOP freshmen in special courses was higher than their mean GPA in regular courses. Respective correlations of HSPR, SCAT Verbal and SCAT Quantitative with each of the three GPA's with similar for SEOP men, but for SEOP women the correlation of these predictors with GPA earned in regular courses were somewhat lower than those with overall GPA and GPA in special courses. There was a slight tendency for SEOP students who scored lower on the preadmission ability measures to have taken more special credits.

The hypothesis of a common multiple regression equation of overall GPA on HSPR, SCAT Verbal, and SCAT Quantitative for the four groups was rejected at alpha = .05, as was the further test at alpha = .05 of the hypothesis of common slopes. The separate regression equations for each group are shown in Table 3

Table 3 about here

At alpha = .05, the partial regression coefficients for HSPR and SCAT Verbal were significantly different from zero within all four groups; the partial regression coefficient for SCAT Quantitative was significantly different from zero only for regularly admitted men.

Multiple correlations of GPA with the linear combination of HSPR, SCAT Verbal and SCAT Quantitative within the four samples are presented

in Table 4 together with approximate estimates of "shrunken" multiple correlations expected should the sample regression coefficients be applied in cross-validation samples (Darlington, 1968, Formula 14).

Since generalized slope differences among the four groups were observed, it was of interest to determine whether differences existed among the groups in their partial regression coefficients for each of three predictors. The four separate regression equations can be subsumed within a single linear prediction equation:

Table 4 about here

$$y_{sg} = a_o + a_s x_s + a_g x_g + a_{sg}\,(x_s x_g) +$$
$$b_h x_h + b_{hs}\,(x_h x_s) + b_{hg}\,(x_h x_g) + b_{hsg}\,(x_h x_s x_g) +$$
$$h_v x_v + b_{vs}\,(x_v x_s) + b_{vg}\,(x_v x_g) + b_{vsg}\,(x_v x_s x_g) +$$
$$b_q x_q + b_{qs}\,(x_q x_s) + b_{qg}\,(x_q x_g) + b_{qsg}\,(x_q x_s x_g)$$

Where: x_s = 1 for women and -1 for men,

x_g = 1 for regular freshmen and -1 for SEOP freshmen,

x_h = HSPR

x_v = SCAT Verbal score,

x_q = SCAT Quantitative score

This descriptively useful equation partitions the partial regression coefficients for all four groups for each predictor into a partial regression coefficient common to the combined groups, into a partial regression coefficient associated with a sex effect, with a group effect,

and with a Sex X Group interaction. Estimated partial regression coefficients for the single equation are shown in Table 5, with asterisks indicating those significantly different from zero at alpha = .01.[1]

Table 5 about here

Partial regression coefficients for the total group were significant for all predictors. Obviously, SCAT Quantitative was significant because of its significance within the large group of regularly admitted men. Regression coefficients associated with the sex effect were also significant for all three predictors, with a positive HSPR coefficient for women and negative coefficients for the two SCAT scores for women. Thus, HSPR (adjusted for SCAT scores) added to the predicted GPA of women, while SCAT scores (adjusted for HSPR and each other) added to the predicted GPA of men.

Two of the three regression coefficients associated with a group effect were significant. HSPR (adjusted for SCAT scores) added to the predicted GPA of regular freshmen, and SCAT Verbal (adjusted for HSPR and SCAT Quantitative) added to the predicted GPA of SEOP freshmen.

Only the one coefficient, associated with a Sex X Group interaction, for SCAT Verbal, was significant. SCAT Verbal added to the predicted GPA of SEOP men and regularly admitted men.

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[1]The writer expresses his thanks to Dr. Horace Norton, Professor of of Statistical Design and Analysis, College of Agriculture, University of Illinois, for his suggestion to apply this model.

SUMMARY

Linear equations regressing GPA on HSPR, SCAT Verbal, and SCAT Quantitative scores were different for regularly admitted freshman men and women at the University of Illinois and freshman men and women admitted to the university's SEOP. HSPR and SCAT Verbal were significant predictors of GPA for all groups, SCAT Quantitative was a significant predictor of GPA for regularly admitted men only. All validities were low.

Significant slope differences among the four equations were explainable in terms of significant sex differences in the partial regression of GPA on each of the three predictors, significant group (SEOP vs. regularly admitted) differences in the partial regression of GPA on HSPR and SCAT Verbal, and a significant Sex X Group X SCAT Verbal effect. In these data, HSPR was a better predictor of GPA for women than for men and SCAT scores better predictors for men. HSPR was a better predictor for regularly admitted than for SEOP freshmen; SCAT Verbal was a better predictor for SEOP freshmen. In addition, within the SEOP sample, SCAT Verbal was a better predictor for women. These results are in agreement with Thomas & Stanley's (1969) review of the effectiveness of high school grades and test scores for predicting the college grades of black students.

Caution in generalizing is required. Admissions standards differed for the SEOP and regularly admitted groups, and the overall GPA of SEOP freshmen was based on grades earned in special and regular coursework. Different grading practices in the two types of courses are confounded with groups. Therefore, grade inflation in the special

courses might be expected to contribute to intercept differences in equations for SEOP and regularly admitted freshmen, and it might also be expected that group slopes would be affected if the reliability of overall GPA was diluted by differential reliabilities for grades in the two types of courses. Interpretation is further clouded because SEOP students enrolled in a varying amount of special coursework. However the data suggest that special and regular GPA's were as equally predictable as overall GPA, except for the GPA earned in regular courses by SEOP women.

It needs to be emphasized that in studies such as this, where students admitted under different standards are not randomly assigned to different programs, questions concerning the "better than expected" achievement of students in the special program cannot be answered because program differences are confounded with group differences. The effectiveness of the special program can better be evaluated on the basis of how successfully it prepares students for later regular coursework.

In these situations, it would appear best to use within group equations with predictors that are valid for an intended purpose. Prudence would also require that attention be paid to large intercept differences.

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TABLE 1

Means and Standard Deviations for SCAT and HSPR Predictors and GPA Criteria

	MEN				WOMEN			
	SEOP (N=168)		Regular (N=2938)		SEOP (N=237)		Regular (N=1917)	
	M	SD	M	SD	M	SD	M	SD
SCAT Verbal	17.3	7.2	31.7	8.9	17.2	7.1	33.8	8.7
SCAT Quantitative	16.0	6.2	35.2	7.7	12.0	4.7	29.1	8.4
HSPR	63.3	24.3	84.9	12.5	73.2	18.7	88.4	10.5
GPA	3.15	0.82	3.59	0.74	3.09	0.82	3.80	0.66
GPA (Regular Courses)[a]	2.88	0.96	---	---	3.01	0.97	---	---
GPA (Special Courses)[a]	3.35	0.94	---	---	3.31	0.93	---	---
Special credits taken	5.49	3.61	---	---	6.60	3.65	---	---

[a]One or more credits of regular coursework was earned by 142 SEOP men and 203 SEOP women; 145 SEOP men and 207 SEOP women earned at least one credit of special coursework.

TABLE 2

Intercorrelations Among SCAT and HSPR Predictors and GPA Criteria[a]

		(1)		(2)		(3)		(4)		(5)		(6)		(7)	
(1)	SCAT Verbal			.37	*.39*	-.21*	*.26**	.23	*.25*	.24	---	.23	---	.04	---
(2)	SCAT Quantitative	.34	*.32*			.06*	*.44**	.14*	*.31**	.22	---	.17	---	-.28	---
(3)	HSPR	.08*	*.27**	.17*	*.42**			.14*	*.35**	.16	---	.15	---	-.28	---
(4)	GPA	.17	*.28*	.11	*.21*	.25	*.34*			.84		.87		.17	
(5)	GPA (Regular)	.11	---	.07	---	.15	---	.82	---			.49		-.09	
(6)	GPA (Special)	.22	---	.13	---	.29	---	.87	---	.42				.10	
(7)	Special Credits	-.21	---	-.17	---	-.09	---	.19	---	.29		-.09			

[a]Correlations for SEOP men (N=168) presented first and regularly admitted men (N=2938) presented second in upper diagonal; correlations for SEOP women (N=237) presented first and regularly admitted women (N=1917) presented second in lower diagonal. Asterisks indicate that the correlations between SEOP and regular groups are significantly different at alpha = .05.

TABLE 3

Regression Equations for All Groups[a]

SEOP Men	$2.15 + .0067\ x_h + .0293\ x_v + .0043\ x_q$
SEOP Women	$2.01 + .0103\ x_h + .0169\ x_v + .0027\ x_q$
Regular Men	$1.47 + .0151\ x_h + .0107\ x_v + .0141\ x_q$
Regular Women	$1.73 + .0171\ x_h + .0143\ x_v + .0025\ x_q$

[a] x_h = HSPR, x_v = SCAT Verbal, x_q = SCAT Quantitative

TABLE 4

Within Group and Estimated Cross-validated
Multiple Correlations of GPA with
HSPR and SCAT Predictors

	Men		Women	
	SEOP	Regular	SEOP	Regular
Within Group R's	.30	.41	.29	.39
"Shrunken" R's	.22	.41	.24	.38

TABLE 5

Estimated Partial Regression Coefficients

Effect	Estimated a-coefficients	Estimated b-coefficients		
Total	a_o = 1.8409*	b_h = .0123*	b_v = .0178*	b_q = .0059*
Sex	a_s = .0277	b_{hs} = .0014*	b_{vs} = -.0022*	b_{qs} = -.0033*
Group	a_g = -.2420*	b_{hg} = .0038*	b_{vg} = -.0053*	b_{qg} = .0024
Sex X Group	a_{sg} = .0990*	b_{hsg} = -.0004	b_{vsg} = .0040*	b_{qsg} = -.0025
Standard Error for coefficients in each column	.0267	.000294	.000823	.001069

*Indicates significance at alpha = .01